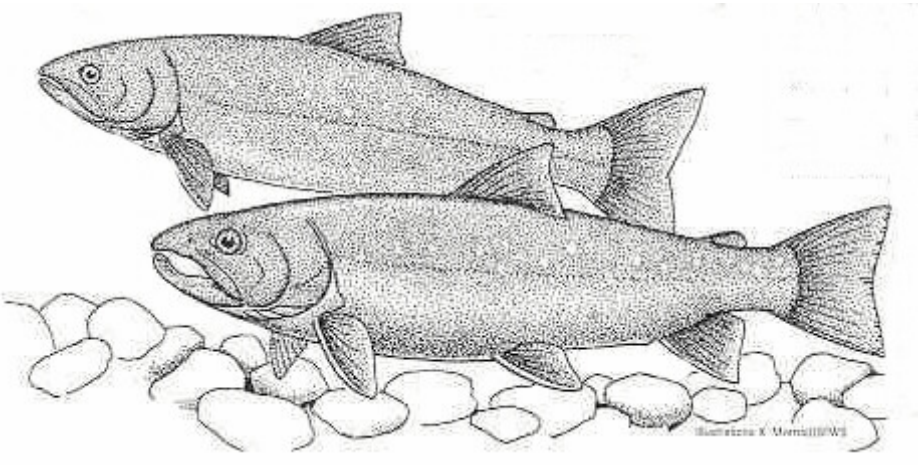
PART 3

TAXONOMY, LIFE HISTORY, and HABITAT REQUIREMENTS of NATIVE SALMONIDS in the Pend Oreille Watershed (WRIA 62), Washington



Pend Oreille Lead Entity
Pend Oreille Conservation District
PO Box 280
Newport, Washington 99156-0280
509/447-5370; pocd@povn.com

In cooperation with

Pend Oreille County
Kalispel Tribe
City of Newport

August 31, 2001

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TABLE OF CONTENTS

Salmonids native to the Pend Oreille watershed include: bull trout, westslope cutthroat trout, Chinook salmon, steelhead trout, mountain whitefish, and pygmy

I. Bull trout

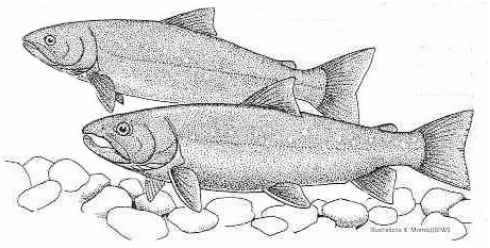
Taxonomy Bull trout are members of the char subgroup of the salmon family and are native to Washington and WRIA 62. They are trout-like in appearance, but generally have finer scales and exhibit a reverse coloration with light crimson to yellow spotting on a darker, olive-green background, while true trout and salmon have black spots on a lighter background (Photo A). While similar in appearance to Dolly Varden, each is genetically distinct. Dolly Varden are most common in Washington's coastal areas and Puget Sound.

The following descriptions of bull trout life history, reproduction, and habitat have been adapted from Governor Philip E. Batt's State of Idaho Bull Trout Conservation Plan (1996).

Life History Bull trout exhibit two distinct life history forms, resident and migratory. Resident populations generally spend their entire lives in small headwater streams. Migratory bull trout rear in tributary streams for several years before either migrating into large river systems (fluvial) or lakes (adfluvial). Migratory bull trout live several years in larger rivers or lakes, where they grow to much larger sizes than resident forms, before returning to tributaries to spawn. Resident and migratory forms may live together, but it is unknown if they represent a single population or separate populations (Rieman and McIntyre 1993). Bull trout migrate to Pend Oreille Lake from tributary streams at age 2 in Idaho (Mason 1985).

After hatching, bull trout fry rear in low velocity water (McPhail and Murray 1979). They find cover in substrate interstices, or within 0.03 meters (m) of the substrate and are associated with cobble and boulders or submerged fine debris where water velocity averages 0.09 m/second (Shepard et al. 1984). The presence of embryos, alevins and juvenile fish in the substrate during winter and spring indicates that highly variable stream flows, bedload movements, and channel instability negatively influence the survival of young bull trout (Goetz 1989; Weaver 1985). The redds of bull trout and other fall spawning fish are particularly vulnerable to flooding and scouring during winter and early spring (Elwood and Water 1969; Seegrist and Gard 1972; Wickett 1958), and to low winter flows or freezing within the substrate. This association with substrate appears more important for bull trout than for other trout and char species (Nakano et al. 1992; Pratt 1984).

Bull trout were listed as "threatened" under the Endangered Species Act in



Juveniles live close to in-channel wood, substrate, or undercut banks (Goetz 1991; Pratt 1984, 1992). Adult resident bull trout also closely associate with the substrate but appear to select large cobble and boulder substrates (Jakober 1995; Goetz 1989), as well as lateral scour and pocket pools (Hoelscher and Bjornn 1989; Pratt 1984) and areas with complex woody debris and undercut banks (Graham et al. 1981; Oliver 1979; Pratt 1985; Shepard et al. 1984). Woody

debris correlated significantly with densities of bull trout sampled in streams in the Bitterroot National Forest of Montana (Clancy 1992). Jakober (1995) found that stream resident bull trout of all sizes conceal themselves in the interstices of large cobble and boulder substrate and large woody debris accumulations during the day.

Although in-stream wood and substrate with clear interstitial spaces correlate with the distribution and abundance of bull trout, habitat complexity in any form can be important (Mullan et al. 1992). Strong bull trout populations will require high stream channel complexity. The amount of cover needed to maintain a strong bull trout population cannot, however, be quantified.

Migratory corridors provide access from over-wintering areas to spawning or foraging areas. Movement undoubtedly is important to the persistence and interaction of local populations within the metapopulation. Disruption of migratory corridors may reduce growth and survival, and possibly lead to the loss of the migratory life-history types. Resident stocks live upstream from natural barriers and an increasing number of barriers caused by human activities. Because these stocks are sometimes isolated in marginal or extreme habitats, they will be at increased risk of extinction (Horowitz 1978).

Reproduction Bull trout generally mature between 5-7 years of age (Fraley and Shepard 1989; Goetz 1989; Leathe and Enk 1985). Bull trout spawn in the fall, primarily September and October (Heimer 1965; Leggett 1969; Oliver 1979; McPhail and Murray 1979; Shepard et al. 1984). Bull trout spawn every year or in alternate years (Block 1955; Fraley and Shepard 1989; Pratt 1985; Ratliff 1992). The migratory fish generally grow larger and have higher fecundity than resident forms. Adfluvial bull trout spawners ranged from 300-875 mm in length at 4-9 years old in the Flathead and Pend Oreille drainages (Shepard et al. 1984; Pratt 1985). Precocious males have been found in the same drainages (Shepard et al. 1984; Pratt 1984).

Decreasing water temperatures may influence the onset of spawning (Shepard et al. 1984; Weaver and White 1985). Some bull trout spawn in streams with ground infiltration, particularly springs (Heimer 1965; Allen 1980; Shepard et al. 1984; Pratt 1984) or groundwater upwelling (McDonnel and Fidler 1985). McPhail and Murray (1979) found egg survival was highest at temperatures of 2-4 C˚. Egg mortality increased with increasing temperatures with 0-20% survival in water 8-10 C˚. Under stable conditions, 40-50% of eggs survive in the wild (Allan 1980). Saffel and Scarnecchia (1995) found the highest density of juvenile bull trout in Lake Pend Oreille tributaries with a maximum summer temperature lower than 13.9 ˚C.

Spawning substrate is typically loosely compacted gravel and cobble (McPhail and Murray 1979; Shepard et al. 1984). Spawning sites include runs or tails or pools with water 0.2-0.8 m deep. Eggs were buried 10-20 centimeters (cm) in the gravel, and water velocities associated with redds were 0.2-0.6 m/second (Shepard et al. 1984). Substrate size has been shown to influence survival in laboratory tests, with survival at 0% with more than 50% fines (less than 6.35 mm) to about 40% with no fines (Shepard et al. 1984). Groundwater or stream bed recharge may result in higher survival to emergence (Shepard et al. 1984).

Habitat Bull trout appear to have more specific habitat requirements than other salmonids. Channel stability, winter high flows, summer low flows, substrate, cover, temperature, and the presence of migration corridors consistently appear to influence bull trout distribution or abundance (Allan 1980; Fraley and Graham 1981; Leathe and Enk 1985; Oliver 1979; Thurow 1987; Ziller 1992).

Temperature represents a critical habitat characteristic for this species. Temperatures above 15 ˚C (59 ˚F) are thought to limit bull trout distribution (Allan 1980; Brown 1992; Fraley and Shepard 1989; Goetz 1991; Oliver 1979; Pratt 1984; Ratliff 1992; Shepard et al. 1984). Goetz (1989) believes that the optimum temperature for rearing is about 7-8 ˚C (45-46 ˚F).

Increased temperature can limit the distribution of other char (Meissner a, 1990) and likely will exacerbate fragmentation of bull trout populations. North Idaho bull trout appear to prefer streams with significant ground water recharge, which relative to other streams in a basin are often the coldest in the summer and the warmest in the winter.

II. Westslope cutthroat trout

Westslope cutthroat trout are members of the trout subgroup of the salmon family and are native to Washington and WRIA 62. [1]Cutthroat trout owe their common name to the distinctive red slash that occurs just below both sides of the lower jaw. Adult westslope cutthroat trout typically exhibit bright yellow, orange and red colors, especially among males during the spawning seasons. Characteristics of westslope cutthroat trout that distinguish this fish from the other cutthroat subspecies include a pattern of irregularly shaped spots on the body that has few spots below the lateral line, except near the tail (Photo B); a unique chromosome complement; and other genetic and morphological traits that appear to reflect a distinct, evolutionary lineage (Trotter 1987, Behnke 1992).

[2]Similar to bull trout, westslope cutthroat trout may be adfluvial, fluvial, or resident, with spawning and early rearing occurring in small tributary streams. They spawn in the spring, generally from March to July, at water temperatures near 10˚C. Spawning habitat has been characterized as gravel substrates with particle sizes ranging from 2 to 75 mm, mean depths ranging from 17 to 20 cm, and mean velocities between 0.3 and 0.4 m/s. Highly embedded substrates may be particularly harmful for juvenile cutthroat trout that typically enter the substrate for cover in winter. Westslope cutthroat trout feed mostly on invertebrates, a feeding strategy that allows them to successfully cohabitate with picivorous bull trout and northern pikeminnow.

III. Pgymy whitefish[3]

[1] Unless otherwise noted, information in this section is adapted from USDI – Fish and Wildlife Service 1999.
[2] Unless otherwise noted, information in this section is adapted from Young 1995.
[3] Unless otherwise noted, information in this section is adapted from Hallock and Mongillo 1998.

The pygmy whitefish (*Prosopium coulteri*) is a member of the whitefish subgroup of the salmon family and are native to Washington and WRIA 62. Like all salmonids, pygmy whitefish have an adipose fin. They are cigar-shaped, brown backed with silver sides and have a blunt snout. Adult pygmy whitefish attain an average length of 12-15 cm (4.7 to 5.9 in.). The largest measured was 28.5 cm (11.2 in.) from Horseshoe Lake in WRIA 62.

There is one other whitefish species present in WRIA 62, the mountain whitefish (*Prosopium williamsoni*). Mountina whitefish inhabit many of the same lakes as pygmy whitefish.

Pygmy whitefish spawn in streams or lakes from late summer to early winter, depending upon geographic location and elevation. They probably scatter their eggs over coarse gravel, as do other species of this genus (Scott and Crossman 1973, Wydoski and Whitney 1979). Pygmy whitefish mature early in life, age 1 to 2 for males and age 2 to 3 for females, grow slowly, and are short-lived. Little is known about pygmy whitefish mortality. However, being a small, delicate fish, they are preyed upon by piscivorous fishes (e.g., bull trout) and birds. Pygmy whitefish diet includes crustaceans, aquatic insect larvae and pupae, fish eggs, and small mulluscs (Wydoski and Whitney 1979). During spawning, they consume their own eggs (Weisel et al. 1973).

Little is known about the habitat requirements of pygmy whitefish. During capture efforts, WDFW biologists almost always found pygmy whitefish in water temperatures below 10˚C (50˚F). Pygmy whitefish are most commonly found in large, deep, unproductive lakes, but they have been found in small, shallow, more productive lakes in Washington and elsewhere. In shallow lakes, they appear to be more vulnerable to predation from exotic fish species (e.g., largemouth bass). Pygmy whitefish appear to need habitat that either has an escape refuge (deep water) from predators or, barring no refuge, has no predators.

IV. Mountain whitefish

To be completed.

References Cited

Hallock, M., and P.E. Mongillo. 1998. Washington State status report for the pygmy whitefish. Wash. Dept. Fish and Wildl. Olympia. 20 p.

State of Idaho. 1996. Governor Philip E. Batt's bull trout conservation plan. Boise, ID. 20 p.

USDI – Fish and Wildlife Service. 1999. Status review for westslope cutthroat trout in the United States. U.S. Fish and Wildlife Service, Regions 1 and 6, Portland, OR and Denver, CO. 188 p.

Young, M.K., tech. ed. 1995. Conservation assessment for inland cutthroat trout. Gen. Tech. Rpt. RM-256. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61p.

PHOTOS

PHOTO A – Bull trout *Salvelinus confluentus*

PHOTO B – Westslope cutthroat trout *Oncorhynchus clarki*